World Agricultural Information Systems And How They Work

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Introduction

There is a shortage of resources of all kinds in the world today: we do not produce enough food; fossil fuels are running out; there is an energy shortage; we are in danger of being short of fresh air, if as we are sometimes led to believe, the rate of pollution is not stopped. One thing we are not short of, however, is literature. World literature is growing at a phenomenal rate. Millions of Books are being catalogued in libraries all over the world. The number of scientific papers is growing with the amount of research being conducted in newer disciplines, e.g. food science and technology, space exploration, laser development and high energy physics. In well established fields such as agriculture the picture is just as explosive, with the rate of increase of new literature reaching some 10% annually.

The goal of any information service is to provide a system that will serve users best and which will lead to improvements in the transfer of knowledge and research. Inadequacies which we encounter due to present conditions are therefore: the rapid growth in science and technology and, in particular, the fast rate at which new research is presented and previous knowledge on a particular subject becomes out of date; the pace at which our own knowledge of the subject becomes date, i.e. our knowledge at the "state of the art" which requires us to undergo continual education; the growth in scientific literature

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represented by the appearance of new serials and the disappearance of established areas; increased specialization which makes communication and exchange of ideas difficult; and finally the role of new forms of information transfer, i.e. mass media techniques and audio visual aids.

The result of all this has been the inadequacy of some systems to cope with the new technology. The first development to force a change of existing services in agricultural and related disciplines was the wider use of the computer in the sixties and early seventies. Until 1970 many information systems in Europe had been operating on a totally manual system of operation; organizing records in a laborious and time-consuming manner. The sheer volume of literature made it apparent that a change over to mechanized methods of data handling was long overdue. Developments in the United States had demonstrated the value of computerized records very early in the postwar period.

The second development was the realization that existing services were not fulfilling the desired aim. In particular, there was a heavy concentration of literature retrieval services located in the developed countries. The major sources of international information in agriculture were the Bibliography of Agriculture (USA), the Commonwealth Agricultural Bureaux (CAB) and Referativnij Zhurnal (USSR). 1/ In 1969, the heads of both the Bibliography of Agriculture and CAB suggested an integrated international system based on FAO. This led to the establishment of the International Information System for the Agricultural Sciences and Technology (AGRIS). This system, which was based on the experiences gained in the field of nuclear science, has as its rationale international co-operation. In a field so vital as food and agriculture the sharing of information for the rapid transfer of new technology began to be seen as one vital link in relieving the pressure on world food supplies.

The Organization of Agricultural Information

International co-operation in agricultural information has generally fallen into two categories. One has been centralized processing of information whereby contributing groups make only a token contribution or a cash outlay and in return receive a subsidized service. The main work of collation and processing is done by a central organization (an example of this is the Commonwealth Agricultural Bureax (CAB). The other form is decentralized where contributing nations or groups do most of the input (INIS, AGRIS); in other words participating countries are made responsible for organizing their own literature. The minimum central control, which is limited to co-ordination of effort and dissemination of the resultant international data base, helps those countries joining to focus their attention on the type of documentation activities that are basic to their own user requirements.

The Soviet Union and the countries of Eastern Europe have organized a similar regional grouping called AGRINFORM. The measures for sharing have been based, in part, on experiences gained in the political and economic grouping, Council for Mutual Economic Aid (CMEA). The sheer volume of information confronting the scientists has meant that mechanization of services was the only key to survival of many existing services and although several manual systems still operate (Tropical Products Institute (TPI) etc.)[2/] the case for automation has been obvious for several years now. The Royal Tropical Institute, Amsterdam which produces Abstracts of Tropical Agriculture were forced to bring in professional help in 1971. [3/]

The Commonwealth Agricultural Bureaux have mechanized their operations since 1973 in an extensive operation accomplished in a remarkably short space

of time. The re-organization was relatively painless largely because the issue of standardization was ducked, or at least deferred. At present, each Bureau operates its own separate indexing system. The reasons for this are complex but may be traced to the origins of CAB: founded in 1929, which went on to develop four institutes and ten bureaux under a loose central control comprising representatives of Commonwealth countries (see appendix B). Since each institute and bureau is chiefly concerned with its own particular branch of agricultural science and tends to act independently and is jealous of its traditions, a wide variety of classifications and indexes have followed. The world literature filtered by CAB is published in twenty abstract journals. Some 350,000 records have been put on tape since January 1973 and the number increases by over 130,000 annually. In addition, there are some 12 journals compiled out of the data base as 'cut and paste' jobs, e.g. Agricultural Engineering Abstracts.

There are many abstract journals in agriculture other than CAB. [5/] Abstract journals have two main aims: to keep specialists informed of significant developments in their fields, sometimes without recourse to the primary document; and to assist in the search for specific items retrospectively. The first of these objectives is satisfied by the production of monthly journals and the second by annual indexes and annotated bibliographies on specific topics from time to time. The value of CAB journals, for instance, lies in the informative nature of their abstracts which is based on the scientific expertise developed over a long period of time at each particular bureau, which are located at important research centres. It has to be acknowledged, however, that many abstract journals are not up to the mark with respect to the primary aims stated abouve, either because of considerable delay in publication (the time lag between the publication of a scientific article and

an abstract appearing in a journal is at best three months but many instances make it more likely to be six months; services in the Soviet Union are an exception in this respect). Annual indexes appear too late to be fully effective search tools for the average researcher who requires access to current data faily quickly.

From the user's point of view, however, the quality, range, length and time lag of abstracts is only one aspect. Another important considerations are: coverage, language and country of origin and availability. Access to primary literature has been considered of secondary importance to the major abstracting services and while efforts have undoubtedly been made to acquire copies of material abstracted for deposit in attached libraries, the documentation of the primary source, not its availability, has been the single most important criterion. Hence, a large proportion of non-conventional literature in the form of unpublished reports government papers, monographs and seminar papers did not get into the centralized system.

In the Soviet Union, however, Referativnij Zhurnal, the abstract journal of the All-Union Institute of Scientific and Technical Information (VINITI), published since 1952 and considered the largest centralized service of its kind, operates no differently in this respect. It manages to produce long, informative abstracts from 20,000 periodicals in 70 languages (up to 1,500 words in some instances) in a rather rapid time (in three months for some material) but access to primary documents has not been apriority except on a limited scale.

Titles and abstracts have been emphasized on separate occasions. It has been noted, for instance, that for every hundred readers who scan titles only ten will bother to read the abstract if available, and only one will want to go back to the original document. [4] Few authors, in fact, recognize the need for abstracts. Therefore many author abstracts have to be re-written which

involves expense, time and effort and the risk of loss of emphasis or distortion of fact.

The role, therefore, of a decentralized system in the dissemination of agricultural research becomes apparent. By evolving a system of national inputs, the problems of access and retrieval of primary literature becomes somewhat easier, at least in the theoretical sense. The availability of documents is still hindered by individual idiosyncracies, political as well as technical, as any librarian will only too readily complain. The problem of standardization is enhanced by the adoption of common principles governing input, vocabulary and searching procedure. In this respect the AGRIS concept comes closest to fulfilling the UNISIST aims as any system so far. There is also a trade-off effect that is becoming increasingly apparent in the spread of the principles of co-operation in information. Not only do we have a transfer of the information downward to developing countries, as for example with regional groupings such as the Agricultural Information Bank for Asia (AIBA), AGRINTER for Latin America, [6] but also new services based on the new system, e.g. AGRIASIA - a current bibliography of South East Asian agricultural literature based in part on the experiences and method of AGRINDEX. A further significant development has been the stimulus the AGRIS system has given to nations to build up their own documentation sources and specialized services as a spin-off from the common policy of sharing services. This has been especially noted on the regional basis where the build-up of a large regional data base is seen as a felt need and where countries weak in control of their own literature can share in the creation of their own national agricultu ral bibliography.

Information systems and the scientist and other users

The information scientist now plays an increasing role in government and

industry in developed countries. In the Soviet Union there are estimated to be some 100,000 persons engaged in this branch of activity alone, some 25,000 of whom are directly engaged in agriculture. The increased emphasis on the professional side has not, however, been matched by much concern from the scientific community itself which makes up the bulk of users. In an age when the librarian and documentalist is taught to examine user requirements we very often find that no one at all is sure what the user really wants. In fact, does the user ever know what he wants since it must be accepted that his needs are constantly changing? Therefore, it is no exaggeration to state that the largest problem confronting efficiency in information systems is user ignorance and a basic inability to make use of existing information tools and services.

In order to get a clear idea of what this means in terms of agriculture, the agricultural user must be identified. In a discipline comprising as broad a subject field as dairy and food industries, helminthologists and farmers, identification of user needs in order to assess the contribution of information services is not easy. The main groups of users may be fitted into the following categories:

(1) scientists or research workers engaged at the academic scholarly level in basic research or experimental farming in one of the fundamental scientific disciplines, i.e. horticulture, plant breeding or genetics, etc.;

(2) professionals, e.g. agricultural engineers, rural development planners, etc.

(3) advisory staffs, extension officers, farm managers;

(4) the farmer, peasant himself.

There is clearly a fundamental difference between all these categories of users. The category least catered for is the fourth, the farmer himself,

especially the needs of the small farmer. Robert F. Chandler, founder of two international research institutes, namely, the International Rice Research Institute (IRRI) and the Asian Vegetable Research and Development Center (AVRDC), speaking at a seminar in Taiwan in 1975, emphasized this succinctly when he said: "The farmer is our client, it is he whom we must serve. Any other objective is trivial compared with our aim to improve the well-being of the rural population and to strengthen agricultural production". The need to get across the results of research rapidly to translate the successes on experimental plots to actual farm conditions is the basic requirement and test of information. Information stored in any system is costly 7/ and useless if it is not put to productive use.

The second category of agricultural users whose information needs are not being entirely met is that of the extension worker. Since the extension officer is involved in day-to-day farm level operations this category of user's requirements tends to directly relate to the farmer. There is a wide variation in the information needs of the scientist, on the one hand, who tends to prefer to scan a large amount of literature for himself, and in a sense will usually have a relatively clear understanding of what he is searching for; (the major abstracting journals cater fairly well for his needs in this respect); whereas the farmer and extension staffs will not. This latter significant group from the production point of view will need current awareness and Selective Dissemination of Information (SDI). Therefore it is ironic, in a sense, that in the age of the computer when SDI services are an integral part of automated information systems the needs of those who require such services most are not being adequately met. Moreover, little extension literature has been incorporated into data bases. The user groups defined above have been pretty broadly defined and within each group it is possible

to delineate a sub-group, i.e. the non-farm rural population or rural youth. Therefore, when we talk about satisfying user needs what we are in effect saying is that the scope of the service is usually aimed at the large institutional user groups engaged in hard core research. So, in order to cater for the needs of the small user group more attention needs to be paid to different forms of information and dissemination and the type of service easily obtained from modern methods. Increasing attention should also be paid to identification of the literature field, particularly these groups require mainly in the area of extension.

The Contribution of Information Services to Agricultural Research

Agricultural research in both developed and less developed countries has grown rapidly in recent years. As the research systems have expanded so have the information systems, but, alas, not always at the same time! Now within the last decade and a half steps have also been taken to narrow the information gap stimulated in part by the establishment in the sixties of the new agricultural research centres such as IRRI, CIMMT, etc. By 1975 there were some nine centres and with the prospect of new international programs yet being developed more emphasis will be placed on the role of information services. In order to satisfy the needs of all classes of user, an international co-operative effort is needed. The initial success in establishing the AGRIS system has clearly been consistent with developments in agricultural research in recent years. By focusing attention on national contributions the system has fulfilled a basic modern trend in that it tries to make more efficient use of local resources. A potential gain has been to expand and strengthen local information centres. This has also a multiplier effect. The more successful a local operation or regional centre is the more it will have a

significant impact on the future participation and role of other countries. Nations can no longer hope to develop in isolation. Therefore additional emphasis is being placed on the importance of clearing houses of knowledge. Clearly, the need for an international information system for agriculture is a felt need. The international co-operative effort helps bind countries together allowing them to develop in a much more substantial way than would otherwise be possible. The immediate payoff is to local users who benefit directly from the new organization of national documentation.

Finally, there is the question of stability. None of the major commercial data bases can guarantee with any degree of certainty the long-term operation of their service. In 1973, CAB faced a cash crisis with the possibility of a drastic cutback in services and some services have not grown at all (Economic Abstracts). Multi-lateral support provides reasonable security of operations. The food problem will not go away, the world agricultural knowledge base is expected to grow not contract. Clearly, information services, both commercial and international, have played a significant role in the increased food production in recent years. How to assess their positive effects is not an easy task. Information is an invisible good like banking and insurance. In any case, many of the probable effects, particularly of an international system like AGRIS, are elusive (but not phantom) and are long-term in their effects, hopefully in a positive way. My guess at present is that the effects of AGRIS, and its counterpart (originating here in the Philippines) AGRIASIA, on national systems will be underestimated. Lack of acknowledgement for its significant contribution to national and regional improvements will occur due to the difficulty of assessing the net effects. Meanwhile, the establishment and consolidation of international and national offshoot systems will continue to be based on value judgements and politics. Quantitative assessments of the

impact on research clearly cannot be precisely stated. However, evaluation on the organization of and investment in information systems is increasingly being based on the need for more stable services as well as on a growing body of experience in new standards. There is comfort in that.

The impact of information services on agricultural research then is varied and rather unquantifiable in the direct cost-benefit sense. But if we are talking about the impact any service may have on the entire system of agricultural research we must recognize that many results will be in intimately bound up with other factors: economic, social, environmental and technological in nature. The portion likely to have a decisive effect on, say, rice research will be a matter of judgement rather than measurement. There are, as indicated in the first part of this paper, many information systems in agriculture, most of which are national in orientation; some are well endowed with staff some are not, some operate with large budgets, some get by on a shoestring. Some, like CAB, have a long established tradition of distinguished association with research institutions while others have been organized in a rather casual manner. Assessing the value of such a diverse community of interests would be beyond the scope of the present paper but even if such an assessment could be realistically made, what would it achieve? It certainly could not be used as a measure of effectiveness of any new system. If we consider the situation from the other point of view, it is possible to say that the growth of research has drawn attention to the need for new standards of information science. Scientists cannot work in isolation like the old medieval scholars, farmers can no longer be expected to be excluded from the result of research. The food for tomorrow's millions will come from today's research efforts and the results of this research translated for the benefit of the millions of small farmers scattered throughout the world. The technology

to produce this food requires to be matched by new standards and techniques in information. There is now every indication that this can be best achieved by co-operative effort and co-ordination of national information systems. This point was put by the Director of the Information Sciences Division, International Development Research Centre to an international group in 1972. "History would have no respect for governments that invested millions for an information system in atomic energy and then neglected to make an adequate investment for a similar system in agriculture. To do so would show a disregard for the real priorities facing the world in which the majority of men and women are suffering the debilitating effects of not having enough to eat. There is an enormous potential for increasing world food production simply by applying existing knowledge". The establishment of AGRIS in the developed world has gone some way to satisfying those sentiments. The subsequent development of AGRIASIA in this part of the world will, it is hoped, consolidate this position and benefit agricultural research even further.

Summary

The development of agricultural information services in developed countries has been characterized by a wide variation in user needs. Language diversity and forms of socio-economic development have resulted in many services, most of which have been oriented to national needs. The existence of large commercial data bases is also significant. Some services cover broad, other rather narrow subject fields. There is also duplication of effort. In the present context of the inflationary spiral, the high cost of services is a problem, and has been a factor for the major development of systems in the richer industrialized nations.

It is now realized that tropical and sub-tropical countries need greater access to the larger agricultural data bases. Less developed countries cannot be expected to resolve the information gap on their own. Therefore, an international collaborative effort has been required. The development of AGRIS, under the leadership of the United Nations Food and Agriculture Organization (FAO), in 1975 was a step in the direction of international co-operation by helping all countries develop their documentation services in agriculture for the benefit of their own national users as well as for the international community as a whole. It is still too early to fully evaluate the benefits if the AGRISsytem. However, there are visible benefits to South East Asia as we have recently seen with the organization of regional literature in the new publication, AGRIASIA.

The future role of information services is now even more crucial to agricultural research. Besides assisting the overall research effort, it has an important part to play in developing new forms of rapid access to knowledge which will speed up the development process. In this respect it is very important to ensure the needs of the whole farming community are being fully met. The overall efficiency of information in the service of agricultural research, on the one hand, depends on the continued availability of trained personnel capable of operating new systems, and on the other, ensuring that the systems fully cater for user's needs. More and more will librarians be expected to act as the vital link formulating and refining what the user needs from the new services.

To summarize, this paper has outlined the role of new services from different angles and has discussed the various patterns of development and identified the main user groups. The rapid advancement of research in agriculture in the past decade alone has highlighted the need to convert the results into mass-scale human activity. This, in turn, leads to the need for new standards in information science and calls for continued international co-operation.

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